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WISMAR HARBOR CONSTRUCTIONS DURING THE TWO-YEAR PLAN

Harbor Engineer Wilhelm Voelckers

Wismar, one of the most important harbors of the German Democratic Republic, is experiencing a new, almost spurt-like development. Compared with 1936, traffic has multiplied. The most important export commodities are potash, sodium sulfate, and products of the machine industry; the main imports are phosphates, cereal, skins, and steel. These activities placed extraordinary demands on the outdated harbor installations. In the course of the Two-Year Plan, therefore, fundamental replacements were undertaken in the port.

Harbor Walls

In 1945 the harbor basins were in poor condition due to war damage and age; the quay in the coal harbor, in particular, threatened to collapse when railroad traffic began there in conjunction with potash export. The shore reinforcement consisted of a pile cluster of three pilings with a wooden bulkhead behind it. Beginning at the water line, a boulder wall has been erected on top of the pile cluster. This wall had shifted horizontally as much as 1.58 meters. Large sections of the wall had collapsed, and the shifting continued so that there was urgent need for repair. During 1947-48, 50 meters of the wall were reconstructed by sinking two wooden "A" frames behind the wooden bulkhead and covering them with planks. Beneath the planks the ground was graded with a slope of 1:1.5 in order to relieve the overstrained wooden bulkheads. The extensive carpentry work involved had to be conducted below the water level and the entire construction basin thus had to be surrounded by steel bulkheads and pumped out. Because this construction method proved to be extremely time-consuming and expensive, other ways had to be investigated to complete the remaining repairs.

In 1947 a commission consisting of Prof Dr Edger Schultze, Dr Krause, and Harbor Construction Director Tiburtius (retired) was formed by the port authorities to systematically investigate all possibilities for further repairs. To determine soil conditions, Dr Muhs and Johannes Ode researchers in

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construction foundations, were called in, and they carried out numerous drilling and laboratory tests. The result of their detailed calculations was that heavy concrete construction was excluded because ground capable of supporting such weight appeared only at great depth and steel bulkheads could not be employed due to material shortages. The following form of construction was proposed:

A grading of 1 : 2, with poles sunk into it. These poles are to be of wood up to the water line, from the water line upward of reinforced concrete; the deck is to be either of wood or reinforced concrete depending on traffic and load conditions. Behind the poles there is to be a short bulkhead for protection against washout.

In 1946, to meet the most acute needs, wooden quays consisting of vertical poles with a plank covering had been erected in the industrial harbor in front of the slaughterhouse. This type of construction lasts only a short time because the poles begin rotting at the water level.

For 100 meters of quay in the wood harbor, concrete pile heads of special construction were used at the water level in 1949. (A detailed description appears in *Der Verkehr*, No 6, 1950, p 177.) Round timber beams with plank cover and subtended by steel were used for the superstructure. This method of construction was further developed for the requirements of the potash harbor, where the sea wall was made accessible to rail traffic by a reinforced-concrete deck. Use of prefabricated concrete girders and slabs from central Germany shortened the construction time appreciably. In 1950, 200 meters were completed in this way. The slabs were designed for a traffic load of 3 tons per square meter. The railroad tracks rest directly on the girders. The use of prefabricated concrete parts is, however, dependent upon the following conditions:

1. Perfect quality of concrete by means of careful granular composition and processing. The concrete must be better than ordinary construction concrete.
2. The most precise adherence to measurements, straight edges, and right angles; otherwise assembly becomes difficult or impossible.
3. Price parity. The concrete, f.o.b. plant, must not be more expensive than ordinary construction concretes. Transport costs do not play a significant role, since cement for Wismar is also obtained in central Germany and the gravel used also has a long distance to travel.

However, the above conditions were not met in the above construction.

For 1951 a further twenty five meters of quays are planned for the potash harbor, to be built as 50-centimeter thick reinforced-concrete slabs in a monolithic manner of construction. This design calls for considerably more concrete, but is required at this location to place the rails freely where needed, which is desirable where switches are used.

Potash-Dumping Installation

The greatest task of the port association of Wismar during the Two-Year Plan was the construction of the potash-dumping installation with a daily capacity of 4,000 tons of potash, by means of which the potash is transferred into the holds of vessels on conveyer belts without manual labor. To handle the heavy freight trains from central Germany it was necessary to construct a station containing 6 kilometers of tracks and its own switch and signal control tower.

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For transportation purposes open cars with movable front walls (these cars are designated by the letters "Om") were equipped with roofs and were given the designation Wuppertal ("Kmm"). The cars are turned on two turntables in the direction of the silo funnels and are then tilted hydraulically. The potash falls onto conveyer belts located underneath the silo funnels. By means of an 80-meter-long subterranean conveyer the potash is carried to the water front and from there is distributed onto the two 100-meter-long water-front conveyer belts with the help of a climbing belt. Six mobile loading machines cover 200 meters of water front. They may be supplied singly or simultaneously by dump cars and they let the potash glide into the holds of the ships. The entire installation is designed for a capacity of 300 tons per hour. This was attained without effort after a brief breaking-in period.

Construction work began in September 1948. The ground conditions necessitated careful soil settling surveys; as a consequence the turntables were laid on reinforced-concrete poles while the silos were placed on a flat foundation. Three meters below ground level there is fine alluvial sedimentary soil, a clayey silt which becomes coarsely granulated toward the bottom. At a depth of 25 meters diluvial boulder clay begins. Settling under the silos was estimated at 8 centimeters and actually occurred to this extent. After every construction phase, it tapered off within 10 to 12 days. When the entire project had been completed, final measurements indicated no further settling.

The floor of the reinforced-concrete silo rests 5.4 meters below the ground water level. The cohesive ground was unsuitable for lowering the ground water by means of run-off pipes. Therefore, open drainage was put in. The accumulation of water was slight at first but became greater the closer the floor was approached, and finally a few wells formed which necessitated the insertion of drainage pipes to make the floor sufficiently dry for laying concrete and applying pulp insulation. Water accumulation amounted to 10 cubic meters per hour.

The transverse channel, the connection between the silo, and the pier carrying the water front conveyer belts were constructed below ground to keep the area free for buildings and railroad tracks. The floor of the pier, however, could be placed above the ground water level, so that waterproofing was not required. The pier is made of round timber and its foundation consists of wooden pilings 16 to 18 meters in length. To enable it to withstand strong winds, knee bracings (K-Verband) made of half-round timber were added. The tracks for six loading machines rest on I beams. After a construction period of a year and a half the entire installation was opened to use on 12 May 1950. Construction costs amounted to 3.8 million Deutsche marks.

Warehouse for 20,000 Tons of Potash

To expand the potash-dumping installation it was necessary to construct a large warehouse where potash could be stored temporarily because the amount of car traffic ashore cannot always be synchronized with the number of bottoms in port. The warehouse is 100 meters long, 28 meters wide, and approximately 20 meters high. It consists of reinforced-concrete outer walls, 3 meters in height, between which stand the concrete pillars designed to hold the three-hinged wooden tie beams. The pillars have wooden poles 10 meters long as foundations. The distance between the trusses is 5 meters. Originally an attempt had been made to construct the trusses from round timber. It turned out, however, that although there is a small price difference between round timber and cut timber, part of the saving was nullified because it is more difficult to obtain round timber in the required dimensions than cut timber, and because the connection of joints with round timber requires more steel than with cut timber. Consequently, two- and three-sectional members from 8 x 16-centimeter beams were used. The warehouse is completely mechanized and is connected with

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the transverse channel of the potash-dumping installation. The warehouse is stocked by conveyer belts and a bucket conveyer which passes the potash to a longitudinal belt in the roof. In clearing the warehouse, two potash scrapers of proven design, each with a capacity of 150 tons per hour, are used to push the potash onto a subterranean conveyer belt running along the longitudinal axis of the building. This conveyer belt is also connected to the transverse channel of the potash-dumping installation. The warehouse and its mechanical equipment are to be completed in the course of 1951.

Sea Channel to Wismar

In 1950 the channel to the Bay of Mecklenburg was deepened. To facilitate night shipping, the existing lights on the Poel and Walfisch islands were expanded into a system of direction lights including newly constructed upper and lower leading lights at Wendorf, Fliesenstorf, and at Walfisch. The foundation of the direction lights consist of wooden octagonal cofferdams of 3.50 meters inside diameter filled with stones and covered with concrete. Because the placement and ramming of the 12-meter-long planks presented difficulties at sea, and long interruptions due to bad weather were likely, a different procedure was employed in the case of two foundations. The cofferdams were assembled while still ashore, braced by interior and exterior frames, and floated in and placed by means of a shears barge. The pile driver then only had to ram the planks on each completed cofferdam individually to the foundation floor; this required 4 days for each cofferdam.

Community Buildings

At the construction sites the workers' quarters were improved and given modern interiors with an adequate number of clothes closets and clean, smooth tables and benches or stools. Curtains were hung on the windows. A new kitchen was erected and equipped with a modern range. A trawler, 23 meters long with a 65-horsepower diesel engine, which the workers of the port association constructed themselves from a wreck, supplies fish for the construction force.

For the workers on the potash dumping installation hot showers with cubicles for men and for women, and the necessary sanitary facilities were installed. At the old harbor a further set of 20 showers for men and 20 for women was constructed, in addition to well-built washrooms with tiled walls and floors.

In addition to the expanded harbor construction the building of workers' quarters was promoted. A total of 31 new apartments have been provided for the employees by converting ruins and attics. These apartments not only improve the situation of the workers, but also prove most economical for the port association because they eliminate the separation bonus to workers.

Since the efficiency of the port of Wismar has been raised considerably in the course of the Two-Year Plan by the construction of the potash-dumping installation, the renovation of quays, and the improvement of the railroad yards and roads, the coming Five-Year Plan envisages continuation of the work on the quays and the erection of new loading bridges and gantry cranes.

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